

On August 12 the Perseids were again in evidence, but not very abundantly. At Bristol between 10h. and 12h. 30m. there were about 17 or 20 per hour, but the watch was not quite continuous. The radiant was very sharply defined at $47^{\circ}+58^{\circ}$ from about 20 paths.

On August 13 the sky was less favourable; there was a good deal of haze, and the stars were blurred and faint; only a few Perseids were seen in these adverse circumstances.

Though the shower generally was not a plentiful one, it is likely to prove interesting in some of its results, for a number of its meteors appear to have been observed at more than one station, and their real paths can be computed.

Three features in reference to the shower of 1904 appear to the writer to deserve special mention:—

(1) The sharply defined point of radiation on August 11 and 12.

(2) The comparatively meagre character of the display.

(3) The fact that nearly all the Perseids appeared on the right (western side) of the radiant. This was very marked, and the writer has been struck with the same peculiarity in preceding years. There were many Perseids in Andromeda, Pegasus, Cassiopeia, Cepheus, and Cygnus, but few in Camelopardus, Auriga, the Lynx, and Ursa Major.

W. F. DENNING.

THE THIRD INTERNATIONAL CONGRESS OF MATHEMATICIANS.

THERE are few towns better suited for a scientific gathering than Heidelberg, and few scientific gatherings have passed off so successfully as the third International Mathematical Congress which met there from August 8 to 13. The number of mathematicians attending the congress was 330, giving with holders of ladies' tickets a total membership of nearly 400. The German Government, the Grand Duke of Baden, the municipal and university authorities of Heidelberg, the Deutsche Mathematiker Vereinigung, and an influential executive committee all joined in giving the congress a hearty welcome, and the local arrangements were perfect.

The formal proceedings opened on Tuesday, August 9, under the presidency of Prof. H. Weber, of Strasburg. The year 1904 being the centenary of the birth of Jacobi, the occasion was selected for the delivery of an address by Prof. Leo Königsberger on Jacobi's life and works. A large volume by Prof. Königsberger dealing with the same subject was published by Messrs. Teubner in connection with the present commemorations.

Another feature of the congress was the presentation, by Prof. Klein, of the first copy of vol. i. of the "Encyklopädie der mathematischen Wissenschaften," which volume has just been completed. Considerable progress was also reported in the preparation of the French edition of the "Encyklopädie."

Prof. Gutzmer, of Jena, presented a history of the Deutsche Mathematiker Vereinigung, founded in 1890, as well as the July part of the *Jahresbericht* of the society, containing papers on the teaching of mathematics.

Passing on to a review of the work done in the sectional and general meetings, the most noticeable feature revealed by the general spirit in which many of the papers were written was the growing tendency in the mathematical world to devote greater attention to the practical and experimental aspects of mathematics, especially in connection with mathematical teaching. From such signs as this it appears not unlikely that we are on the eve of a renaissance period in the history of mathematics. A large collection of models, mathematical instruments, apparatus, and books was exhibited in the large hall of the museum. Prof. Runge, of Hanover, exhibited and described Leibnitz's calculating machine. A number of experiments on fluid motion past various boundaries were shown by Prof. Prandtl, of the same town. These differed from Prof. Hele-Shaw's experiments with thin films in that a vessel of some depth (say an inch or two) was used, and water or liquid of small viscosity employed; in this case a series of vortices were seen to be thrown off in succession from a cylindrical or other obstacle, and the various stages of formation of each vortex were clearly demonstrated by photographs as well as experimentally.

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Prof. Greenhill's discourse on the theory of the top, considered historically, also contained an attempt to give graphical representations of the motion of the top, and was illustrated by experiments with bicycle wheels and other equally simple apparatus.

Coming to matters of more purely educational interest, Prof. Klein, in his address to the applied mathematics section, gave an amusing account of the methods in vogue in certain German middle schools for obviating the use of the calculus, a state of affairs reminding one of the old Cambridge "three days." Prof. Loria, of Genoa, stated that the attempt to abolish Euclid in Italy had failed owing to the badness of the text-books brought out to meet the new conditions, that a Government prize had been in consequence offered for a good manual on geometry, and that the books of Veronese, Enriques, Amaldi, Paolis and others were the result.

Prof. Gutzmer urged that elasticity and thermodynamics should form part of the training of every professor of applied mathematics. Resolutions were passed by the congress urging the Government to provide models and projection-lanterns for use in teaching mathematics in the German schools and technical colleges. A further resolution related to the teaching of geometrical drawing in schools.

In connection with the historical section, a resolution was passed relating to the publication of Euler's works by the Carnegie Institution. Prof. Schlesinger announced the appearance of the first volume of the works of L. Fuchs, and a bibliography of Wronski's works was presented by Prof. S. Dickstein.

Of papers in applied mathematics, the most remarkable was Prof. Sommerfeld's investigation on the motion of electrons; the remaining papers dealt *inter alia* with the problem of three bodies (Profs. Delaunay and Levi-Civita), equations of wave motion (Profs. Volterra and Hadamard), attractions (Prof. Genese), and geodesy (Prof. Börsch and others).

In pure mathematics the most striking papers were those by Prof. Hilbert on integral equations and on the foundations of arithmetic, and Prof. König's proof that the continuum cannot be equivalent to any well ordered group. Prof. Painlevé, of Paris, gave an admirable discourse on the integration of differential equations; Prof. Segre, of Turin, on the geometry of to-day; and Prof. Wirtinger, of Vienna, on Riemann's lectures on hypergeometric series. We also note papers by Prof. Schlesinger on Riemann's problem, by Prof. Borel on approximations of continuous functions, and many others too numerous to mention. Prof. E. Study showed that the paradoxical result $2=4$ could be obtained from considerations of intersections of quadric surfaces.

The congress was international in every sense, the membership including representatives of Germany, France, Great Britain, Italy, Switzerland, Austria, Sweden, Denmark, Spain, Russia, Japan, the United States, Greece, and other countries. Only seven of the members present were from Great Britain.

For the meeting place of the next congress in 1908, Rome has been selected, and the congress will take place at a somewhat earlier time of the year (probably about Easter). In this connection a prize is offered for the best thesis on the theory of algebraic gauche curves. It has been decided to hold the next following congress in England.

Not the least important feature of the congress was the large amount of local interest shown in the organisation of social entertainments. On Wednesday, August 10, a dinner was given to all the members in the new Town Hall of Heidelberg. On the Thursday we were received and entertained at Schwetzingen by the Hereditary Grand Duke of Baden. The next evening we sailed down the Neckar in illuminated barges, and on reaching Heidelberg the castle was illuminated by red fire, the proceedings ending with fireworks, including a set-piece of the Pythagorean Theorem (Euc. i., 47). The last evening we were entertained at a concert at the castle, followed by another illumination and a Kommers, for which a special song-book had been published that included a number of amusing mathematical songs written for the occasion. To make this insight into German student life more real, two delegates were elected by the students of German universities to officiate in the uniform of their corps, and with their swords.

The town concerts and many places of interest were specially thrown open to members. The arrangement of meeting places in one or more *cafés* was another feature which added considerably to the social success of the meeting. Excursions were organised to the Stift Neuberg, to Speyer, and up the Neckar Valley.

Mathematicians who had known of one another for years as mere names have now become personal friends, and we shall carry away life-long reminiscences of the many pleasant meetings which have done much to cement the bond of union between fellow workers in all branches of mathematics, and of all nationalities. G. H. BRYAN.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—On Monday, August 22, the University of Cambridge conferred seventeen honorary degrees on the occasion of the meeting of the British Association. The following are the speeches delivered by the Public Orator, Dr. Sandys, of St. John's College, in presenting those of the recipients who received the degree of Doctor in Science for distinction in natural sciences, mathematics, or anthropology:—

OSKAR BACKLUND, PROFESSOR OF ASTRONOMY,
ST. PETERSBURG.

Ab exteris exorsi, primum omnium salutamus nuntium quendam sidereum, ab arce illa celeberrima prope Petropolin stellis observandis dedicata ad nos devectum, quae trium deinceps Struviorum nominibus iamdudum gloriatur. Ipse talium virorum haeres dignissimus, planetarum potissimum in moles motusque perturbatos diligenter inquisivit, et Enckii praesertim cometen, ter in quoque decennio inter sidera nostra lucentem, indagandum sibi sumpsit. Dum cometae illius reditum in mense proximo spe certa expectamus, sideris illius indagatorem indefessum hodierni diei inter lumina libenter numeramus.

HENRI BECQUEREL, PROFESSOR OF PHYSICS, PARIS.

Francogallorum e republica vicina cursu prospero ad nos pervenit scientiarum Academiae Parisiensis socius illustris, cuius etiam patrem avumque honore eodem ornatos fuisse constat. Ipse in vi magnetica praesertim exploranda diu praeclare versatus, nuper propterea imprimis famam est adeptus, quod metallum, sideris Urani inventoris in honorem, olim Uranium nominatum, primus omnium nuper probavit ipsum radios quosdam mirabiles emittere, quos etiam per metalla transire non dubitare. Laetatur virum tam illustrem scientiae lumen, a patre suo sibi olim traditum, splendore novo a sese exactum, etiam aliis invicem iamdudum tradere. Etenim, scientiae quoque in lumine vitali per saecula hominum tradendo,

“sic rerum summa novatur
semper, et inter se mortales mutua vivunt...
et quasi cursores vitae lampada tradunt.”

J. W. BRUEHL, PROFESSOR OF CHEMISTRY, HEIDELBERG.

Salutamus deinceps virum urbis Palatinae inter professores illustres iamdudum numeratum, virum in scientia chemica insignem. Ut rem scientiae illius ad historiam pertinentem paulo altius repetamus, inter physicos antiquos olim, uti nostis, finem secundis corporibus esse negavit quidem Anaxagoras, Democritus autem affirmavit; Democriti vero atomos, per duo milia annorum inutiles et infructuosas existimatas, scientiae chemicae saltem inter professores rursus in honore esse constat. Viri huiusce autem inter merita id potissimum commemoratur, quod, experimentis exquisitis iam per quattuor et viginti annos adhibitis, praeclare ostendit, quae potissimum inter res in unum revera compositas atque atomorum, rerum earum in particula quaque consociatarum, distributionem ratio intercedat. Unde fit, ut etiam in rebus perquam multiplici modo compositis, atomorum illarum nexus accuratius explicentur, atque etiam in coloribus quibusdam novis vetera illa Lucretii verba denuo vera reddita sint, quo docente rerum primordia

“variis sunt praedi a formis,
e quibus omne genus gignunt variantque colores
propterea, magni refert quod semina quaeque
cum quibus et quali positura contineantur.”

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ADOLF ENGLER, PROFESSOR OF BOTANY, BERLIN.

Universitatis Berolinensis e professoribus praeclaris adest vir, qui arborum et herbarum provinciam eximiam iam per annos quadraginta luculenter illustravit. Hoc iubente, quot arborum genera conifera, quot liliorum varietates, quot dicotyledonum species obscurae, e tenebris in lucem novam surrexerunt! Idem (ne plura commemorem) etiam scientiae suae Acta a se condita iam per annos tres et viginti edidit, genera plantarum omnia in ordinem optimum reduxit, ne palaeontologiam quidem neglexit, neque Africam Orientalem neque Americam Australem inexploratam reliquit. Quod ad alios attinet, Victoris Hehnii librum celeberrimum de transitu plantarum ex Asia in Europam conscriptum accuratorem reddidit, etiam plantarum per orbem terrarum distributionem Alexandri Humboldtii in memoriam prosecutus. In scientia botanica nemo fortasse hodie Plinii ipsius verba sibi verius potest arrogare:—“non unius terrae sed totius naturae interpretes sumus.”

PAUL VON GROTH, PROFESSOR OF MINERALOGY, MUNICH.

Ex urbe pulcherrima, quod Bavariae totius caput est, ad nos pervenit vir studiorum in regione pulcherrima versatus, qui crystallorum scientiam physicam professus, Milleri nostri, viri insignis, crystallorum describendorum rationem et ipse praetulit et aliis omnibus per Europam totam commendavit. Quantum in scientia sua in ordinem redigenda atque etiam aliis tradenda profuerit, testantur Acta illa ab ipso condita et per annos plus quam quinque et viginti edita; testantur tot discipulorum et amicorum etiam inter externos gratulationes recentissimae; testatur praeceptoris tanti in honorem imago ipsius arte eximia depicta et anni huius paulo ante Kalendas Maias donata; testatur hodiernus denique dies, quo nomen viri “quem rumor alba gemmeus vehit pinna,” tituli nostri signo honorifico consignamus. Etiam hodierni diei memor, poterit fortasse Martialis verba mutuari:—

“Felix utraque lux, diesque nobis
Signandi melioribus lapillis.”

ALBRECHT KOSSEL, PROFESSOR OF PHYSIOLOGY, HEIDELBERG.

Urbem Palatinam denuo in memoriam vocat physiologiae illius chemicae professor insignis, quae quicquid vivit perscrutata, tot corpuscula textu tenuissima explorat et explicat, tot cellulas absconditas in lucem protrahit et enucleat. Abhinc annos sex eiusdem Universitatis, eiusdem scientiae, professorem in hoc ipso loco laudavimus, qui in unoquoque e tribus decenniis hanc scientiam magnopere adjuvit. In professore illo laudando sperabamus intra proximum decennium fore ut talium virorum laboribus physiologiae in provincia chemica laurus plurimae referrentur. Quod illo die sperabamus professoris illius successor feliciter ratum effecit.

HENRY F. OSBORN, PROFESSOR OF ZOOLOGY, NEW YORK.

E republica maxima trans aequor Atlanticum diu prospere constituta laetatur ad nos advectum esse virum palaeontologiae praesertim in scientia insignem, qui non modo in Universitate Columbiana, nobis et linguae et studiorum communium societate coniunctissima, zoologiam praeclare proficitur, sed etiam, Eboraci Novi in Museo maximo, animalium ingentium e rupibus ipsis effossorum multitudinem saxeam, sive Dinosauri sive Atlantosauri nominantur, sive alio aliquo nomine splendido gloriantur, summa sollertia conquisivit, summa arte disposuit, summa cura custodit. Gaudemus rempublicam illam, tot rerum novarum varietate excellentem, etiam vitae pristinae vestigia tam antiqua tanta cum alacritate persequi. Luvat virum hospitii iure cum plurimis coniunctum Ennii ipsius in verbis etiam propterea laudare, quod, in Museo illo “multa tenens antiqua,” ipse “egregie cordatus homo” esse perhibetur.

VITO VOLTERRA, PROFESSOR OF APPLIED MATHEMATICS,
ROME.

Quem genuit Ancona, quem arx antiqua Etruriae suo nomine ornavit, quem primum Pisarum, Galilei cum memoria consociatarum, deinde Augustae Taurinorum, denique Romae ipsius Universitas inter professores suos numeravit, multis profecto nominibus observantiae vestrae commendatur. Sed, ut relictis nominibus ad res ipsas progrediamur, inter peritos constat virum hunc lucis praesertim